

**RECORD OF THE COPPER SHARK, *CARCHARHINUS BRACHYURUS*,
FROM THE BALEARIC ISLANDS (WESTERN MEDITERRANEAN)**

by

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RÉSUMÉ. - Capture d'un requin cuivré, *Carcharinus brachyurus*, aux Baléares, Ouest Méditerranée.

Le requin cuivré *Carcharhinus brachyurus* est signalé pour la première fois aux îles Baléares. Ce signalement étend donc sa distribution en Méditerranée. Le spécimen débarqué au port de Palma de Mallorca est une femelle de 220 cm LT. Ses caractéristiques morphologiques et méristiques sont données. L'hypothèse de l'existence d'une population méditerranéenne est discutée.

Key words. - Carcharhinidae - *Carcharhinus brachyurus* - MED
- Balearic Islands - First record.

The copper shark, *Carcharhinus brachyurus* (Günther, 1870), is a tropical and subtropical species with a world-wide distribution, which occurs from inshore to offshore waters and from the surface to a depth of, at least, 100 m (Compagno, 1984). It seems to be migratory, and the Mediterranean Sea has been included in its geographical distribution area since Garrick's (1982) earliest reports. Subsequently, some catches in the Alboran Sea and Algerian, Italian and Greek waters confirmed its current presence in the Mediterranean. Nevertheless, according to Orsi-Relini (1998), the scarce knowledge of this species in the area has not permitted a decision on whether it is a pelagic Atlantic transient,

which occurs mainly in the Alboran Sea and occasionally reaches more central or eastern localities, or whether the Mediterranean has its own population.

In this note, the first capture of *Carcharhinus brachyurus* is reported from the Balearic Islands (western Mediterranean), therefore completing the gap between already known localities in the Mediterranean Sea. The value of dental formulae to distinguish a hypothetical Mediterranean population is also discussed.

MATERIAL AND METHODS

The *Carcharhinus brachyurus* specimen (a female of 220 cm total length) was landed at the Palma de Mallorca fish auction wharf on 20 March 2000. It was captured south-east of the Cabrera Archipelago, with a drifting pelagic longline targeted for catching swordfish (*Xiphias gladius*). The study was based on: photographs of the whole specimen, the head (Fig. 2), deposited at the *Museu Balear de Ciències Naturals* (Sóller, Illes Balears; catalogue number: Cat. MBCN 2890) and some teeth (Fig. 3). In the laboratory, measurements were taken from the jaws and the entire head (Tab. I). Morphometric measurements follow Compagno (1984).

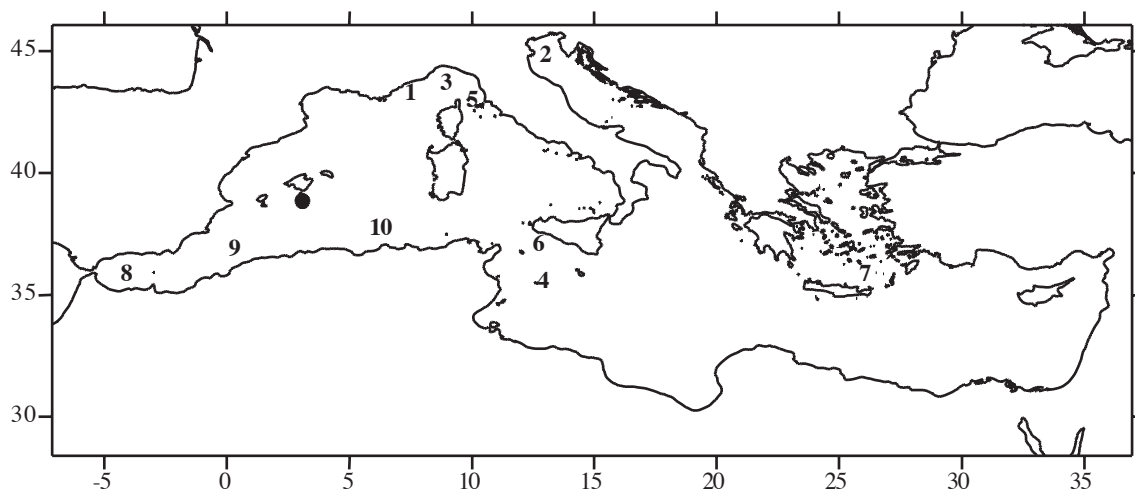


Figure 1. - Area of *Carcharhinus brachyurus* capture in the Balearic Sea (•) and other locations (1-10), in which this species was captured in the Mediterranean Sea. Numbers correspond to reference numbers from table II.

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Table I. - Morphometric measurements of the head of the *Carcharhinus brachyurus* captured off the Balearic Islands.

Parameter	mm	% Total length
Preorbital length (POB)	135.1	6.14
Prenarial length (PRN)	98.7	4.49
Preoral length (POR)	151.3	6.88
Eye length (EYL)	24.0	1.09
Eye height (EYH)	19.2	0.87
Interorbital space (INO)	227.6	10.34
Mouth width (MOW)	187.2	8.51
Mouth length (MOL)	84.0	3.82
Internarial space (INW)	125.5	5.71
Nostril width (NOW)	27.6	1.26
Anterior nasal flap (ANF)	4.8	0.22

DESCRIPTION OF THE BALEARIC SPECIMEN

The identification of the specimen was based upon morphological characters appearing in the photographs, the morphometric analysis of its head, and its dentition. The shark presented a gen-

Figure 2. - Lateroventral view of the head of the *Carcharhinus brachyurus* specimen captured off Balearic Islands.

eral bronze-brown colour. Inconspicuous pale bands on the flanks and darker edges of most of the fins were also present. This coloration pattern agrees with those described by Bass *et al.* (1973), Moreno (1982) and Compagno (1984). The presence of interdorsal ridge could not be ascertained from the photographs. The snout was moderately long and rounded. Despite the existing variability in the ranges given by several authors (e.g., Bass *et al.*, 1973; Garrick, 1982; Compagno, 1984; Chiaramonte, 1998) for morphometric measurements of the head of the species, the values from the Balearic specimen (Tab. I) showed consistent results with these ranges.

Although the jaws arrived in the laboratory partially sectioned at the upper and lower left junction, we assumed that the upper and lower left half jaws were symmetrical with the right ones. The upper and lower right half jaws measured 195 and 161 mm, respectively. Both of them were measured from the corner to the central symphysis, along the functional teeth bases. According to this data, the upper and lower jaw perimeters were determined as 390 and 322 mm, respectively. The horizontal opening, measured transversally from corner to corner, was 197 mm and the vertical opening, measured between the upper and lower symphysis, was 144 mm. The distance between the last lateral teeth of both upper jaws (position 15) was 183 mm. The teeth count gave the following dental formula: 15 - 1 - 15 / 15 - 1 - 15 which agrees with the range reported by Garrick (1982).

Since the shape of the upper teeth of *Carcharhinus brachyurus* is considered as a character that allows to identify the species (Garrick, 1982), their description confirmed the identification of the Balearic specimen (Fig. 3). The upper lateral teeth were gradually more oblique from the symphysis to the corner (except those in position 1, which were almost triangular), with their cusps pointing to the corner. They had large bases and narrow, fine serrated cusps with concave lateral edges. The lower teeth were narrower and less oblique than the upper teeth, and were acutely serrated. The upper jaw had one functional row, while the lower jaw had two rows.

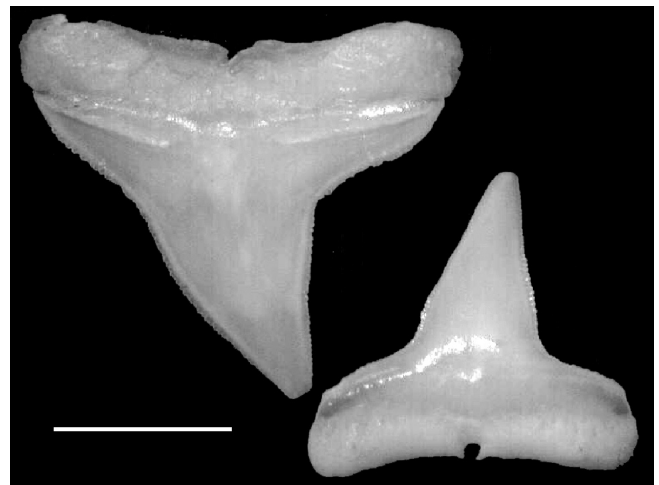
Figure 3. - Upper and lower teeth (position 4) from the left half jaws of the *Carcharhinus brachyurus* specimen captured off Balearic Islands (Scale bar = 5 mm).

Table II. - Catches of *Carcharhinus brachyurus* from the Mediterranean (TL: total length). ¹ as *Carcharhinus acarenatus* by Moreno and Hoyos (1983), synonymized with *Carcharhinus brachyurus*.

Area	Year	Specimens	Reference
1 Nice (Ligurian Sea)	1881-1898 (NMV 39364)	80 cm TL and 5 embryos	Garrick (1982)
2 North Adriatic	1906	123 cm TL	Garrick (1982)
3 Camogli (Ligurian Sea)	1906	250 cm TL	Orsi-Relini (1998)
4 Sicilian Channel	1981	185 cm TL female	Cigala Fulgosi (1983)
5 Tuscany (Northern Tyrrhenian)	1980	260 cm TL female containing 14 embryos	Vacchi <i>et al.</i> (1996)
6 Mazara del Vallo (Sicily)	Contemporary	1 female and 5 males 185-276 cm TL	Fergusson (1994)
7 Rhodes	1990	60 cm TL	Fergusson (1994)
8 Chafarinas Islands (Alboran Sea)	Contemporary	4 females 150-235 cm TL 7 males 150-250 cm TL	Moreno (1982) ¹
9 Western Algerian coast	1998-2000	2 females 170-306 cm TL 3 males 186-303 cm TL	Hemida and Labidi (2001) Hemida (pers. comm.)
10 Eastern Algerian coast	1998-2000	2 females 192-231 cm TL 2 males 181-285 cm TL	Hemida and Labidi (2001) Hemida (pers. comm.)
11 Algerian coast	Contemporary	2 specimens	Hemida (pers. comm.)

Table III. - Dental formulae of *Carcharhinus brachyurus* given by different authors. ¹ as *Carcharhinus remotus*. ² as *Carcharhinus acarenatus*.

Area	Dental formula	Reference
Sicilian Channel	$\frac{15 - 1 - 15}{15 - 1 - 14}$	Cigala Fulgosi (1983)
Ligurian Sea	$\frac{15 - 2 - 15}{14 - 1 - 14}$	Orsi Relini (1998)
South Africa	$\frac{15 - 1 - 15}{15 - 1 - 15}$	Smith and Heemstra (1986)
	$\frac{15 - 1 - 15}{15 - 1 - 15}$	Bass <i>et al.</i> (1973)
Western Atlantic	$\frac{13 \text{ to } 15 - 1 \text{ or } 2 - 13 \text{ to } 15}{14 \text{ or } 15 - 1 - 14 \text{ or } 15}$	Sadowsky (1967) ¹
	$\frac{14 \text{ to } 16 - 1 \text{ to } 3 - 14 \text{ to } 16}{14 \text{ to } 16 - 1 \text{ to } 3 - 14 \text{ to } 16}$	Garrick (1982)
Eastern North Atlantic and Alboran Sea	$\frac{15 - 2 - 15}{14 \text{ or } 15 - 1 - 14 \text{ or } 15}$	Moreno (1982) ²
Algerian coasts	$\frac{15 - 2 - 15}{15 - 1 - 15}$	Hemida (pers. comm.)
Argentina	$\frac{15 - 2 - 15}{15 - 1 - 15}$	Chiaramonte (1998)

CARCHARHINUS BRACHYURUS IN THE MEDITERRANEAN

Although the presence of *Carcharhinus brachyurus* was stated in the Mediterranean Sea since ancient times (Garrick, 1982; Orsi-Relini, 1998), there are few reports of this species in the area (Tab. II). Of the 35 specimens caught to date, 11 (31%) were captured off the Chafarinas Islands (Alboran Sea), other 11 (31%) off Algerian coast, 7 (20%) in the Central Mediterranean (around Sicily) and only 4 (11%) in the northern part (Ligurian Sea, North Adriatic and Northern Tyrrhenian). The remaining two came from

the Balearic Islands, in the current report, and Rhodes. These data show a distribution pattern with the highest occurrence near the Strait of Gibraltar and adjacent waters, and a subsequent decrease inwards towards the Mediterranean, with an occasional occurrence in northern and eastern areas. This could suggest a transit of Atlantic individuals, previously reported for *Carcharhinus altimus* by Moreno and Hoyos (1983), entering occasionally into the Mediterranean. According to Garrick (1982), *Carcharhinus brachyurus*, like the other requiem shark *Carcharhinus obscurus*, can extend up to, and possibly over, latitude 40° (confirmed by the Ligurian Sea, North Adriatic and Northern Tyrrhenian records). In this sense, the seasonality of this species in the Alboran Sea, as

shown by catches in June-August during a three year sampling period (Moreno, 1982), and in Algerian coasts, with catches ranging from April to August but with a maximum during July (Hemida, pers. comm.), could also suggest seasonal migration from Atlantic waters during the warm months, which could extend to central and eastern localities (Sicily and Rhodes). The higher occurrence of *Carcharhinus brachyurus* during the summer agrees with data obtained by several authors in South Africa and Argentine waters (Cliff and Dudley, 1992; Chiaramonte, 1998). However, it is interesting to point out that, in the Mediterranean Sea, *Carcharhinus brachyurus* has also been recorded during winter months (December and March) in more northerly areas, where the water temperature is lower than those for which the species shows a preference.

It is difficult to determine the incidence of the Atlantic population in the Mediterranean. Since Orsi-Relini (1998) the study of dentition could help to solve the question concerning the existence of such a Mediterranean population. In this sense, this author suggested that the only two dental formulae from Mediterranean specimens known to date seemed to be more the exception than the rule (Tab. III). Nevertheless, data reported in this study agree with those given by Bass *et al.* (1973) and Smith and Heemstra (1986) for South African populations. The dental formula derived from the five Mediterranean specimens now studied 15 - 1 or 2 - 15/14 or 15 - 1 - 14 or 15 shows more similar coincidences between the inner and outer Mediterranean specimens than within the inner ones. For this reason, we believe that there are not enough data to consider the dental formula as a typical feature that could be used to distinguish a hypothetical population of *Carcharhinus brachyurus* in the Mediterranean.

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